Testing the ASIP process using the Tracy Fish Test Facility

Project description

New test facilities, including a 500 cfs test channel, would be developed near the existing Tracy Fish Collection Facility, (Old River, near the border of Contra Costa, San Joaquin, and Alameda Counties). Additional testing and research activities would be conducted at Reclamation's laboratory facilities at Denver, at UC Davis laboratories, and potentially at the fish release sites in cooperation with the California Department of Fish and Game Bay-Delta Division's Fish Facilities Research Unit.

Large Delta diversions such as the Federal Tracy Pumping Plant and the California Harvey O. Banks Pumping Plant presently divert millions of acre feet of water using fish protection facilities developed with 1950's louver technology. Modernizing the fish facilities is made difficult in this setting by complex needs for screening, collecting, holding, and re-distributing fish in a challenging environment of tidal cycles, heavy debris loadings, lack of sweeping flows at diversions, and numerous listed and non-listed species requiring protection from entrainment. Major tasks include final design engineering with "construction ready"specifications for a test facility up to 500 cfs; fishery-engineering research to assist and refine facility design and future construction, operation, and evaluation; completion of all environmental compliance and permit requirements and documents; and, overall project management and coordination. The primary purpose of the proposed facility would be testing and evaluation of new fish salvage and debris handling methods. However, after completion of the necessary testing, the facility could be operated to provide improved fish salvage and increased operational flexibility for existing salvage operations.

Major aspects of modern Delta fish protection technology that would be pursued to meet present-day criteria include:

- improved, automated debris handling and separation/removal;
- use of louvers and positive barrier screens (0.2 ft/s approach velocity) operated together to achieve initial sorting of fish by size and positive screening;
- development of fish crowder mechanisms to move fish and predators through channels to bypass, holding, and transport facilities;
- control of hydraulics through the intake channels in the face of changing tidal effects and water diversion rates;
- using fish friendly lifts to provide bypass flows and deliver fish into above ground holding chambers for further debris removal and fish sorting; and
- overall improvements in fish transport and stocking activities.

Other components requiring testing and development include:

- trash deflector;
- fish friendly trash rack and cleaner;
- water return system;
- fish bypass systems;
-on-ground holding/separator structures;
- hauling truck loading and transport methods; and,
- facilities at fish re-distribution sites in the Delta.

H-001859

Future construction of a facility would be overseen by Reclamation's Mid-Pacific Region Construction Office. A Tracy Technical Advisory Team, (TTAT), consisting of representatives from USBR, DWR, DFG, USFWS, NMFS, and the San Luis Delta-Mendota Water Authority has been meeting monthly since November to provide guidance and technical input on potential needs for a Tracy Fish Test Facility. The TTAT would be continue to help refine final designs and operations of a Tracy facility, and to make recommendations for future evaluation and research priorities.

Location and /or Geographic Boundaries of Project - The prototype test facility would be located on the Old River, near the border of Contra Costa and Alameda Counties, near the Federal Tracy Fish Collection Facility on Bureau of Reclamation land. Testing would occur at the Federally-owned Tracy site, Reclamation labs in Denver, UC Davis labs, and near fish redistribution sites on the lower San Joaquin and Sacramento rivers (Contra Costa County).

Primary Species Addressed

Winter-run chinook salmon
Late-fall run chinook salmon
Fall-run chinook salmon
Spring-run chinook salmon
Steelhead
Delta smelt
Splittail
Green Sturgeon
Longfin smelt
Striped bass
Other: Note that all south Delta fish species are associated with the salvage facility; other "important" species addressed include American shad, threadfin shad, channel catfish, and white catfish

Preliminary Design Criteria

I. HYDROLOGY

1. Maximum High Tide El ? Maximum Normal High Design Water Surface El +7.0 (Height used for existing structure design)
2. Minimum Low Tide El ? Minimum Normal Low Design Water Surface El. +2.0 (Height used for existing structure design)

II. MAIN CHANNEL

Structure

1. Datum Drawing elevations based on old spec drawing elevations (3 ft above NGVD 29). Spec will use NAVD 1988 (need cross reference). Design Diversion Flow During Low Tide 2500 cfs (500 cfs per channel) Channel Invert Elevation (to be determined)
2. Channel Top Elevation +11.0 Channel Inside Width (to be determined)

3. Channel design to be dewatered
4. Seismic Loads 0.3 g (preliminary estimate)
5. Deck Loading HS-20 loading? Deck Width 15 to 20 Feet?

Trashracks

1. Upstream Trashracks Clear Openings Existing 2.125 inch, New trashrack openings test 3", 6", and 2"
2. Downstream Trashracks (upstream of main pumps) 6" bar spacing
3. Trashrack Slope Between 3 to 18 degrees off of vertical
4. Trashrack Strength 2/3 of depth to yield
5. Trashrack Cleaning Methods Upstream trashrack - automatic trash rake with trash conveyance system, 4000 pound lifting capacity - cleaning cycle startup capability - continuous, set time interval, set differential water level
6. Manual cleaning of downstream trashracks.

Stoplogs

1. Stoplogs and Slide Gates to Isolate Main Channel full differential head
2. Design Approach Velocity at Louvers 1 ft/s (to be confirmed in labs)
3. Louver Angle Approximately 30 to 40 degrees (to be confirmed in labs)
4. Louver Slot Size To be determined by lab tests (assuming 3 to 6 inches)
5. Louver Material Steel (stainless steel?)
6. Louver Strength 3 feet uniform load (hydraulic)
7. Louver Cleaning Method Automatic trash rake with conveyance system, 1250 pound lifting capacity

Fish Screens

1. Design Approach Velocity at Screens 0.2 ft/s
2. Sweeping Velocity (Min.) 2 times approach velocity
3. Screen Configuration Angle Vee and/or straight line arrangement, 5 degree angle
4. Screen Slot (Opening) Size (Max.) 3/32 inch or 1.75 mm max. openings??
5. Screen Type Stainless steel wedgewire (also looking at copper-nickel and Z-alloy screens)
6. Sealing Tolerances Same as screen slot opening (max. opening between guide and screen side seal, and screen bottom seal and invert)
7. Screen Panel Size undetermined at this time (assuming 10 to 12 feet wide)
8. Bar Orientation Vertical
9. Screen Strength 3 feet of uniform load (hydraulic)
10. Screen Panel Percent Open Area (min.) Greater than 40 percent
11. Screen Cleaning Method Horizontal sweeps, brush upstream side of screens (also need to clean downstream side of screens with high pressure spray water, 1 to 2 times a year, may require raising screens Operation capability - continuous, set time intervals, set differential water levels, 5 minute cleaning cycle (max.)
12. Main Channel Pumps three 400 cfs thruster pumps at the end of the channel, with

variable-speed drives (normal operation - 500 cfs at entrance of channel at low tide)

13. Water Level Measuring System(s)
14. Number and Locations 4 Sensors - upstream of trashracks, upstream of louvers, upstream of fish screens, downstream of fish screens
15. Control Water Level Differentials Signal to turn on trashrack cleaning system at 6 inch differential across upstream trashracks, signal to turn on louver cleaning system if 3 inch differential across louvers, signal to turn on fish screen cleaning systems if 3 inch differential across fish screens?

Adjustable settings

1. High Water Level Differential Alarms 1 Foot differential across upstream trashracks, 6 inch differential across louvers, and 6 inch differential across fish screens (adjustable settings)?
2. Sensor Type Undetermined at this time (capacitance probe, ultrasonic transducer, or pressure transducer)

Miscellaneous

1. Adjustable Baffles Immediately behind fish screens, removable, adjustable in place, 3 foot uniform load (hydraulic), steel (stainless??)
2. Fish Crowders To be determined by labs
3. Stoplogs to Isolate Individual Pump Bays
4. Gantry Crane ?? Ton capacity
5. Flow Metering Type Undecided at this time (could be open channel flowmeters in main channel upstream of louvers, or flowmeters in pipes downstream of each thruster pump, or within return channel)

III. RETURN FLOW CHANNEL(S)

1. Options, Pipes, Concrete box culverts, open channel(s) or combinations

IV. FISH BYPASS SYSTEMS

1. Type of Fish Bypass Systems Fish lift and/or gravity systems
2. Number of Fish Bypasses 3 Bypass bay locations (2 used at a time)
3. Design Operating Flow Up to 84 cfs each bypass (to be determined)
4. Minimum Bypass Entrance Width 2 feet
5. Entrance Height Floor to max. operating water surface
6. Bypass Entrance Isolation Bulkheads

V. BYPASS PIPELINES

1. Minimum Velocity in Pipe 3 ft/s
2. Maximum Allowable Velocity 10 ft/s
3. Minimum Allowable Pipe Diameter 2 feet

4. Finish Joints to be filled and smooth, welds ground flush
5. Minimum Bend Radius 5 pipe diameters
6. Pipe Material Steel motar-lined and coated, HDPE, and concrete pipe (AWWA 361)
7. Grade of Pipeline No high points between bypass bay and outlet
8. Designed to be dewatered
9. Flow Metering Type Single or 4-path ultrasonic flowmeter in each bypass pipe

VI. FISH LIFT OPTION

1. Fish Lift Type Archimedes screw lifts and/or screw centrifugal (helical) pumps
2. Number of Fish Lifts/Bypass Pipe 1 to 2 (undecided at this time)
3. Design Operating Flow Maximum 84 cfs, per pump (to be determined)? (unless secondary screening option used)
4. Design Lift Range Above Water Surface Approximately 10 to 17 feet
5. Valves to Isolate Lifts and/or Redirect Flow Knife gates or pinch valves??

VII. SEPARATOR/HOLDING STRUCTURE

1. Design Operating Flow Maximum 84 cfs per bypass (to be determined)
2. Number of Separatirs/Bypass 2 (allows bypass to be always operating), flow direction to separators controlled by slide gates
3. Design Approach Velocity at Screens (Fixed, Rotary Drum, or Traveling Screens) 0.2 ft/s max.
4. Screen Slot (Opening) Size (Max.) 3/32 inch or 1.75 mm max. openings??
5. Fixed Screen Type Stainless steel wedgewire (also looking at copper-nickel and Z-alloy screens)
6. Sealing Tolerances Same as screen slot opening (max. opening between guide and screen side seal, and screen bottom seal and invert)
7. Channel Top El. +17.0 for fish lift options and El. +11.0 for gravity flow option
8. Screens at Downstream End of Channels Rotary drum screen, traveling water screen or fixed inclined screen with fish lift options and traveling water screen, or fixed inclined screen with gravity flow option
9. Adjustable Baffles Immediately behind fish screens, removable, adjustable in place, 3 foot uniform load, steel (stainless?)
10. Flow Controls Behind Screens Fish lift bypass option - adjustable weirs with gravity return flows to downstream canal
11. Gravity bypass option - pumps with variable speed drives downstream of screens
12. Separator Bar opening undetermined at this time, steel (stainless?)
13. Cleaners - Fixed Screens Horizontal sweeps, brush, operation capability - continuous, set time intervals, set differential water level
14. Fish Crowders to be determined by lab tests
15. Pipes to Hauling Trucks Load Area 18 to 24 inches
16. Minimum Slope of Pipes 0.0005
17. Valves Knife gates or pinch valves??
18. Water level sensors/channel Upstream of screens and downstream of screens

19. High differential control and alarm 3 inches across fish screens to startup cleaning cycle, 6 inches across fish screens for alarm

VIII. HAULING TRUCK LOADING AREA

1. Options Ramp down for hauling truck access or lift holding tank up and onto hauling truck flatbed?

IX. ROADS

1. Width
2. Surfacing

X. UTILITIES

1. Bring power to site from either Tracy Pumping Plant or from Western line
2. Backup Power (Redundancy) Other power lines, engine-generator???

XI. CONSTRUCTION WINDOWS

1. In-river work July 15 to December 31??

XII. MATERIALS

1. Cast-in-place Concrete 4,000 psi
2. Reinforcement 60,000 psi
3. Steel FY36
4. Stainless Steel 304, 304L, 316, or 316L (need to check water quality)
5. Grating Galvanized steel
6. Handrail Galvanized steel

XIV. WATER QUALITY MONITORING EQUIPMENT

1. Temperature Analyzer
2. Conductivity Analyzer
3. Turbidity Analyzer
4. pH Analyzer
5. Sample pumps

XV. FISH HAULING TRUCKS

1. Size of tanks 2000 Gallon, 1000 gallon and 400 gallon

XVII. SECURITY

1. Fencing, cameras?

XVIII. LEVEES